Post Office Box 27766 | Raleigh, NC 27611 | (919) 719-7282

How Does Your Garden Grow? (6th Grade)

Purpose

Students will be able to create a school garden using multiple academic disciplines.

Subject Area(s)

English Language Arts, Science

Common Core/Essential Standards

ELA

- **CCSS.ELA-Literacy.RL.6.4** Determine the meaning of words and phrases as they are using in a text, including figurative and connotative meanings; analyze the impact of a specific word choice on meaning and tone.
- **CCSS.ELA-Literacy.RL.6.1** Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
- **CCSS.ELA-Literacy.RL.6.10** By the end of the year read and comprehend literature, including stories, dramas, and poems, in the grades 6-8 text complexity band proficiently, with scaffolding as needed at the high end of the range.
- **CCSS.ELA-Literacy.RL.6.2** Determine a theme or central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.

Science

- **6.L.1** Summarize the basic structures and functions of flowering plants required for survival, reproduction and defense.
- **6.L.2** Explain the significance of the processes of photosynthesis, respiration, and transpiration to the survival of green plants and other organisms.

Agricultural Literacy Outcomes

Food, Health & Lifestyle

- Identify sources of agricultural products that provide food, fuel, clothing, shelter, medical and other non-food products for their community, state, and/or nation.
- Identify the careers in food production, processing, and nutrition that are essential for a healthy food supply.

Science, Technology, Engineering & Mathematics

- Identify science careers related to both producers and consumers of agricultural products.

Plants and Animals for Food, Fiber & Energy

- Explain how the availability of soil nutrients affects plant growth and development.

Essential Questions (The student should be able to answer these questions AFTER the lesson has been taught)

1. How is the Design Cycle helpful in planning a project, such as a school garden?
2. Are school gardens important? Why or why not?
3. Describe the food producer and food consumer relationship.
4. What specific process occurs in plants that creates energy for the plant?
5. What plants do well in my school's climate? Which were less successful?

Vocabulary

Food Producers: organisms who produce food for consumption
Food Consumers: organisms that eat the food produced for consumption
Photosynthesis: process by which plants contain chlorophyll for making carbohydrates from water and carbon dioxide in the presence of light
Carbon monoxide: colorless, odorless gas released by humans that plants use to create food through photosynthesis
Design Cycle: a system of steps designed to help students complete a project such as: Investigate, Plan, Design, Create, and Evaluate
Scientific Inquiry: process of asking questions through research based skills; Ask Question, Do Background Research, Construct Hypothesis, Test an Experiment, Analyze Results, Report Results.

Student Motivator

Review with students what they know about *Food Producers* and *Food Consumers*. Ask the following questions:

1. *Have you ever been on a farm?*
2. *Do your parents have a garden at their home?*
3. *What do you know about how plants grow?*
4. *Would a farmer be a food producer, food consumer, or both?*
5. *Name a few food commodities that are raised or grown on a farm.*

Next, have students survey their classmates on what they believe are necessary materials for a *food producer* such as plants to grow in a healthy environment. After gathering data, the students can log responses in a spreadsheet to use as supportive research.

Background Knowledge

Note: Students will have completed a study through the Essential Standards lessons to outline key parts of plants; Plant Structures, Plant Properties, Plant Processes.

Scientific Inquiry is used to help students conduct scientific research as it applies to a specific experiment or project. Students ask questions through research based skills, do background research, construct a hypothesis, test the experiment, analyze the results, and report the results. It is important for the students to utilize the *Scientific Inquiry* concepts prior to the activity in order to determine what makes the activity most successful as well as what would cause it to fail.

Many of our students have little knowledge about how the food they eat gets to their lunch plate. Less than 2% of our United States population produces for the rest of our population[1]. The average age of an American farmer is 57[2], and yet the agriculture industry continues to provide more jobs each year.

Food producers come in all shapes and varieties. From farming animals to plants, each producer provides a critical role in the food web that *food consumers* consume such as cucumbers and squash from vegetable plants, hamburger from beef cows, and milk from dairy cows.

Students will spend time investigating, planning, designing, creating, and evaluating a school site garden. This is considered as a *Design Cycle*. By understanding the basic needs for plant growth, students will be able to investigate which plants would grow best in the soil on their school site. After a hypothesis has been formed, students will pant the materials needed and what type of garden they would like to host. Designing the school garden will require Math, ELA, and Science skills with the Scientific Inquiry being used as a foundation. Students will create a school garden as a result of the work they preloaded into the activity. Finally, students will decide if the school garden needs improvements for future growth.

Materials

- Plot of land (5x5, 10x10, various sizes) or an active greenhouse
- Bags of soil
- Plant seeds
- Water source
- Watering tool
- Hand shovel
- Scissors
- Measuring cup for soil
- Planting containers

- Soil boxes for the lab
- Gardening gloves (one pair for each student)
- Safety goggles
- Paper
- Pencil or pen
- Camera
- Computer
- Spreadsheet software
- Journal (one for each student)

Procedures

Activity 1:

Engage

1. Students will plan which type of garden would be the best fit for the campus.
2. Have students research the different types of gardens. Students should also decide to use found or new materials. Students should be encouraged to use recycled materials since it is the most cost effective and will be accessible on the property.
3. Review with students what they know about *Food Producers* and *Food Consumers*. *Have they ever been on a farm? Do their parents have a garden at their home? What do they know about how plants grow?*
4. Display the *Garden Picture Cards* and ask students to survey each other on what they believe are necessary materials for plants to grow.
5. After gathering data the students can log responses into a spreadsheet for supportive research.

Explore

1. Walk around the school campus and have students look for recycled materials. Students should pay close attention to size and shape of the material as well as condition of the material.
2. The students will determine the amount of space needed based on plant size. A mature plant's size determines if it requires more or less space, and in some cases plants benefit from a neighboring plant which provides shade or support. The North Carolina Department of Agriculture and Consumer Services Availability Chart is a helpful tool for planting.
3. Ask the students, *"Which materials are most durable?"* Note that wood is a good resource to build a raised bed garden because it doesn't disturb the natural environment and can be manageable when cleaning and repairing.

Explain

1. This activity will involve students planning a school garden. Set up 45 minutes each day for one week to complete the Design Cycle work. Each meeting should be used to work on the specific task planned for each day.
2. The first 5 minutes will be used for students to create and discuss a list of "must does" with their team's assignment. The last 5 minutes will be used for "catch ups" and reflection on what they will accomplish in the next meeting. See the work schedule below:
    Day 1: Investigate
    Day 2: Plan
    Day 3: Design
    Day 4: Create
    Day 5: Evaluate
3. From the first day of Investigating, students will record research and student responses collected around the room or in small groups.
4. After the daily task is complete students will spend 10-15 minutes reflecting on what happened during the class meeting, what work is to be done next, and how they contributed to the garden's success. A student at any point should be able to rehearse what the goal of the activity is and what steps he/she took in order to make the learning outcome happen.
5. Students are planning out a school garden, gathering materials for a school garden, putting together a school garden, and then producing food from the school garden with time and maintenance.

Elaborate

1. Remind the students that a garden takes time and materials.
2. Students will set up a watering schedule and plant maintenance rotation to participate in.
3. Each student will serve as a plant caretaker to make sure the plants are receiving proper sunlight, water, and soil for growing within the two week time frame.
4. Students should be encouraged to talk to the plants, a process that helps the plant receive *carbon monoxide*. The plant then digests the carbon monoxide and produces leaves using that energy.
5. Remind the students that soil temperature is important. Growing plants during warm seasons ensures that the soil temperature is at 70 degrees consistently. Again, The North Carolina Department of Agriculture and Consumer Services Availability Chart is a helpful tool for determining best times for planting with the correct soil temperatures.

Evaluate

1. After plants have started to emerge from the soil, it is important that the students discuss what will make the current plant more successful and how to produce more plants in the future.
2. Have students make daily observations and record what they see in their science journals.

3. Students may be encouraged to build onto the garden or add plants that would thrive in close spaces.
4. After working through the two weeks of gardening, it will be evident what works and does not work for the soil type that is available.
5. Remember, too much water makes the seedlings wilt and halts growth, but too little watering will create a "burnt" effect on the plant. Soil that is high in sodium will not produce. Soil testing kits can be accessed through the Agriculture Extension Offices in each County of North Carolina.

Suggested Companion Resources

- KidsGardening—Designing a School Garden
http://www.kidsgardening.org/designing-a-school-garden/
- Starting a School Garden Video
http://www.youtube.com/watch?v=qXO5NYV6bCc
- School Garden Ag Mag
https://www.dmsfulfillment.com/FarmBureau/DMSStore/Product/ProductDetail/24764

Essential Files

- North Carolina Department of Agriculture and Consumer Services Availability Chart
http://www.ncagr.gov/markets/chart.htm
- *Garden Picture Cards*

Ag Facts

- Less than 1% of adolescents get their recommended servings of healthy foods, such as fruits and vegetables[3].
- Several studies indicate that hands-on environmental education projects and civic engagement can improve test scores[4].
- Students fed a steady curriculum of gardening, cooking, and nutrition have significantly better eating habits than children who don't get the same instruction[5, 6].

Extension Activities

- Have students create a promotional video about their activity and share it with other classrooms.
- Students can write letters to the local newspaper about what they were able to accomplish or share with the district website.

- Students can create a water garden (aquaponics lab) to produce leafy plants from water and without soil.
- Students can research how animals such as the beta fish provide resources to plants like the water lily, and how they thrive together.
- Students can plan sharing the food grown in the garden with afterschool clubs, other classes, or even local restaurants.
- Have students set up a training program for other classes on how to grow and maintain a school garden.

Sources & Credits

1. http://www.fb.org/newsroom/fastfacts/
2. http://www.start2farm.gov/usda/knowledge
3. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2654704/?tool=pubmed
4. http://www.servicelearning.org/instant_info/fact_sheets/k-12_facts/impacts
5. http://www.ecoliteracy.org/book/smart-nature-schooling-sustainability
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Lesson Author

This lesson plan was written by Natosha Brinkley in partnership with the Kenan Fellowship Program as a 2014-2015 Kenan Fellow. Her mentors throughout the fellowship included:

- Andy Gray, Grayhouse Farms Inc-Stony Point, NC
- Michele Reedy, North Carolina Farm Bureau Ag in the Classroom-Raleigh, NC
- Tracy and Sheila Jenkins, Jenkins Farms-Stony Point, NC